Oceanodroma matsudairae obtained by 'ATLANTIS II' in the Indian Ocean; with anatomical note

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The Research Vessel, 'ATLANTIS II' of the Woods Hole Oceanographic Institution, Massachusetts, U.S.A., visited Japan during 25-30 September, 1965 after her International Indian Ocean Expedition. On this occasion, one of the two frozen specimens of *Oceanodroma matsudairae* obtained in Indian Ocean was forwarded to me for confirmation of record by the courtesy of Mr. Roger Pocklington, who was the chief ornithologist on board.

This storm-petrel breeds on N. Volcano I. (San Alessandro I. 25°25' N, 141°16'E) in the subtropical North Pacific from January to early June and has been known once from Sagami Bay, Japan, in May, 1921 (five males), but its summering waters were unknown. Recently, Mr. R. Bailey (1965) reports that this species was seen in Indian Ocean within 5° of the equator from the Royal Research Ship 'DISCOVERY'.

Here, I heartily express my thanks to Mr. R. Pocklington and other ornithologists on the 'ATLANTIS II' for their kindly letting me examine this rare specimen.

The specimen

The specimen is labelled as follows:

"Collected at 13° 26' S, 120° 19' E on 29 July, 1965, during R/V ATLANTIS II, Cruise 15"

This is a male, with small testicles, and in full molting.

Measurements: Weight 62 gm., Total length 248 mm., Body length (shoulder to cloaca) 64 mm., Wing extension 550 mm., Wing breadth (secondaries) 80 mm., Wing 180 mm., Tail 104 mm., Tail-fork 30 mm., Tarsus 25.5 mm., Culmen 15 mm., Total wing area 340 cm², One side primary area 88 cm², One side secondary area 68 cm², Tail area (spread 45 degrees) 80 cm².

Molting: Both upper and underparts are in molt, mottled with old and new feathers as shown by Fig. 1. All tail feathers are old, but wings are symmetrically molting.

Note: Another similar species *O. tristrami* also breeds on the same island October to April, but this species summers north to Japanese waters. Thus, from a breeding stock on the same island, *matsudairae* should have evolved as a warm adapted and blacker species migrating southward and *tristrami* a cold adapted bro-

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wner species migrating northward. This probably caused dis coincidence of their breeding seasons, and therefore reproductive segregation. *Mastudairae* has white base of the shafts of primaries which is said to be quite characteristic while flying (after Mr. Pocklington).

Anatomical notes

Some anatomical notes and measurements were taken which are as follows.

General body form: Measurements of skinned body were taken according to Kuroda (1961), as shown in Fig. 2, Tables 1 & 2.

Table 1. Measurements of skinned body (Ventral) (mm.)

Thoracic depth (l)	Girth (m)	Trunk length (d)	Pectoral length (i)	Belly length (e)	Anterior pectoral breadth (i)	Posterior pectoral breadth (k)	Keel length (n)	Clavicular width (cl)
32	90	—	39	35	32	24	28	10.5

Table 2. Measurements of skinned body (Dorsal)

Cervical length (a)	Body length (b)	Thoracic length (f)	Scapular length (g)	Dorsal width (h)	Inner scapular distance (h')	Dorso-pelvic length (c)
52*	—	21	—	23	12	—
Pelvic length (q)	Outer tibial breadth (s)	Hip breadth (t)	Pelvic breadth (r)	Anterior pelvic length (u)	Posterior hip length (v)	Femoral length (w)
23	28	20	11.5	15	9	20.5

* Includes 2 cervico-dorsal vertebrae.

Muscular amount: The amount of muscles of pectoral and pelvic appendages were measured (Table 3).

Digestive tract: The intestinal coil is of cyclocoelous type (Fig. 2, I) and the coiling is reversed just at the middle point. The coecum is an unpaired single nod and the tongue is of simple shape (Fig. 2). The measurements are given in Table 4.

Fig. 1. Wing spread form and showing molting pattern (on 29 July). White part shows old and hatched part new feathers. Note the growing primaries 5 and 6 (also its covert), secondaries 4 and 9, and tertiaries 1 and 2. The molting is symmetrical on both wings (left wing shown).

Fig. 2. Body form and some anatomical sketches. I (lateral), II (ventral) and III (dorsal) show body form and measurement items. Ia, b, c, d: Intestinal convolution, with a single coecum; P: Size of *M. subcoracoideus*; T: Tongue form; S: Showing salt glands; L: Lung form; Li: Liver; g: Gall bladder; K: Kidney; H: Heart form (long type)

Table 3. Weights of pectoral and leg muscles (gm.) of one side

Large pectoralis*				Small Pectoralis	Thigh muscles	Tibial muscles
Lateralis	Proprius	Profundus	Total			
0.9	1.6	0.7	3.2	0.5	0.5	0.6

* For muscular layers cf. Kuroda (1960).

Table 4. Measurements of the digestive tract (mm. & gm.)

Tongue	Weight of oesophagus & proventriculus	Intestine		Coecum length	Rectum length
		Weight	Length		
—	4.9*	3.0	320	Single 4	12

* With milky content and one small stomach stone.

Table 5. Measurements of various organs (mm. & gm.)

Nasal salt gland	Liver					Lung
	Left		Right		Total Weight	
	Size	Weight	Size	Weight		Size
Width 6	25×17	1.2	30×10	1.2	2.4	20×13

Lung	Heart (ventricle)		Kidney		
Weight	Size	Weight	Length	Width	Weight
0.5	17×11	0.6	—	Anter. 18 Poster. 9	1.1

Table 6. Relative weights (in %) of various organs and parts for body weight

Liver	Lung	Heart (ventricle)	Oesophagus & proventriculus	Intestine	Kidney
3.87	0.806	0.968	7.90	4.84	1.77

Pectoralis (One side)			Leg muscles (One side)		
Large	Small	Total	Thigh	Tibial	Total
5.16	0.8	5.97	0.8	0.9	1.77

Other organs: The measurements and forms of some organs are shown in Table 5. The nasal salt glands are developed for skull size. There is a large gall-bladder in the right lobe of the liver. The lung is small and the heart is long

type. The kidney is relatively large. The relative weights for body weight of various organs are shown in Table 6.

References

- Bailey, R. 1965. Second interim report on the International Indian Ocean Expedition. *Ibis* 107 (1): 133-134.
- Kuroda, N. h. 1960. On the pectoral muscles in birds. *Misc. Rep. Yam. Inst.* 2 (No. 14): 50-59 (With Suppl. note in *ibid.* No. 16: 66, 1961).
- Kuroda, N. h. 1961. Analysis of three adaptive body forms in the Steganopodes, with note on pectoral muscles. *Misc. Rep. Yam. Inst.* 3 (1) (No. 16): 54-66.

Additional note: After finishing this paper, I sent my specimen to Dr. G. E. Watson, Smithsonian Institution, according to his request to compare it with his other *Atlantis II*'s specimen. As the result, he confirmed that the both are *matsudairae* although his bird had the longest (29 mm) and mine the shortest (25 mm) tarsi for the species. For reference, I show here the tarsus and wing measurements of 47 males and 44 females preserved in Yamashina Institute (Momiya collection) in Table 7.

Table 7. Measurements of tarsus and wing of *O. matsudairae*
from San Alessandro I. (Momiya coll.)

a. Tarsus						
Tarsus (mm)	25-	26-	27-	28-	29	Mean
47 ♂ ♂	1	20	16	9	1	22.6
44 ♀ ♀	5	6	22	8	3	27.0
Total	6	26	38	17	4	26.8

b. Wing							
Wing (mm)	178	180-181	182-184	185-187	188-190	191-194	Mean
47 ♂ ♂	1	2	10	16	9	9	186.8
44 ♀ ♀		1	6	14	16	7	187.5
Total	1	3	16	30	25	16	187.1

My specimen with fresh feathers is distinctly blacker than numerous examples from the breeding island obtained during 1928-1935 which are similarly faded to brown by long preservation and molting stage is difficult to confirm. The Smithsonian specimen is, according to Dr. Watson, 'somewhat duller and a little browner' than mine, 'but not as brown as specimens collected in 1929.' The dates and number of specimens of Momiya collection from the breeding island (at Ishino and Nishi villages) are shown in Table 8, and it may be said that although some may remain offshore around the breeding island, it may well be that they migrate to southern seas.

Table 8. Number of specimens of *O. matsudairae* by month
obtained on San Alessandro I. (Momiya coll.)

Month	J	F	M	A	My	J	Jy	Au	Total
	5	1	14	12	11		3	1	47
	2	2	7	14	13	5	1		44
Juv.				7	3				10

Note: Beside these, there is a specimen from S. Volcano I. (San Augustino I.) obtained on April 1, 1936.

クロウミツバメのインド洋記録と解剖所見

黒 田 長 久

クロウミツバメはオーストンウシツバメと同様北硫黄島に 1—6 月繁殖するがこの海域以外では従来相模湾で 5 月に得られたにすぎない。今回 1965 年 9 月東京湾に寄港した北米のインド洋調査船第 II アトランティス号の Pocklington 氏の御好意でインド洋で得られた 2 標本のうち 1 個体の寄贈を受けた。北硫黄島の繁殖期は両種で約 2 ケ月の差があり、クロウミツバメは南にオーストンウシツバメは北方日本近海に渡る。これは恐らく同島に繁殖した原個体群に温度適応の異なる群を生じ、渡りの方向が反対となり、従って繁殖期もずれ、濃色のクロウミツバメ（初列風切の羽軸基部白く、飛翔時も識別できるといふ）と褐色のオーストンウシツバメの種分化をなしたのであろう。標本につき換羽や解剖所見を附記した。なお、他の 1 標本はスミソニア研究所の Watson 博士に送られた。山階研所蔵の繁殖地の靱山標本の測定についても附記した。